

BROWNWATER BOTTOMLAND HARDWOODS (HIGH SUBTYPE)

Concept: Brownwater Bottomland Hardwoods communities are forests of Coastal Plain floodplain terraces and ridges other than active natural levees, lacking a significant component of levee tree species, and naturally dominated by bottomland oaks, hickories, sweetgum, and locally pine. The High Subtype covers examples that are the farthest above the river. They are thus flooded relatively infrequently and for short periods. They are generally dominated by combinations of *Quercus michauxii*, *Quercus pagoda*, *Quercus laurifolia*, and *Liquidambar styraciflua*.

Distinguishing Features: Brownwater Bottomland Hardwoods are distinguished by occurrence on floodplains of brownwater rivers but away from the riverbank or natural levees. These are sites where overbank flooding is, or was in the past, important. The canopy is dominated by wetland oaks and *Liquidambar*, and characteristic levee species such as *Platanus occidentalis*, *Betula nigra*, and *Celtis laevigata* are generally absent except in disturbed areas. Other levee species such as *Fraxinus pennsylvanica*, *Acer negundo*, and *Ulmus americana* may be present but in smaller numbers than they have in levee forests. In contrast to Nonriverine Wet Hardwood Forests with similar canopies, Brownwater Bottomland Hardwoods generally lack a significant component of acidic wetland shrubs such as *Lyonia lucida*, *Ilex glabra*, and *Cyrilla racemiflora*, while species such as *Ilex decidua* are often present.

The High Subtype is distinguished from the Low Subtype and Swamp Transition Subtype by canopy dominance by the more mesophytic bottomland hardwoods such as *Quercus michauxii* and *Quercus pagoda*, with only a small component of wetter site species such as *Quercus lyrata*, *Carya aquatica*, and *Taxodium distichum*. *Quercus laurifolia* may be abundant in all subtypes and does not readily distinguish among them.

The High Subtype is distinguished from Mesic Mixed Hardwood Forest by the dominance of the species above. *Fagus grandifolia* typically is abundant in Mesic Mixed Hardwoods but scarce or absent in Brownwater Bottomland Hardwoods, while *Liquidambar styraciflua* and *Quercus laurifolia* are scarce or absent in natural Mesic Mixed Hardwoods. *Quercus pagoda* and, more often, *Quercus michauxii* may be in both but is more frequent and more abundant in floodplains. While Mesic Mixed Hardwood Forest near rivers is usually on distinct upland slopes, the highest ridges on river terraces may support patches of it.

Synonyms: *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678).

Ecological Systems: Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250). Southern Atlantic Coastal Plain Large River Floodplain Forest (CES203.066).

Sites: Brownwater Bottomland Hardwoods occur in the interior of brownwater river floodplains, away from the natural levees and from the active river channel. They occur on the higher areas of the floodplain: former natural levees abandoned by channel shifts, ridges in scrollwork ridge-and-swale systems, and potentially on more extensive flats on terraces.

Soils: Brownwater Bottomland Hardwoods generally have sandy or silty soils with high fertility. Examples are mapped with a variety of soils, with no series predominant. Many are alluvial soils

such as Chewacla (Fluvaquentic Dystrudept), Chastain, or Wehadkee (Fluvaquentic Endoaquepts). Many others are mapped as older soils shared with wet uplands, such as Roanoke (Typic Endoaquult), Tarboro (Typic Udipsamment), Altavista (Aquic Hapludult), Wickham (Typic Hapludult), or a number of others. Given the heterogeneity of floodplain soils, many of these may be inclusions or may not be typical of the named soil series. In any case, those mapped with upland soils have vegetation distinct from upland communities.

Hydrology: The High Subtype is intermittently flooded. Flooding probably occurs only in the highest floods and only for relatively brief periods. Nevertheless, the nutrient enrichment brought by flooding likely is important to the distinctive character of these communities. Soils may also sometimes be saturated by floods that don't inundate them. When rivers are not in flood, the sites are well-drained.

Vegetation: The High Subtype is a forest that is typically dominated by a varying mix of *Quercus laurifolia*, *Quercus michauxii*, *Quercus pagoda*, and *Liquidambar styraciflua*. A diversity of other trees are often present, have high frequency in CVS and other plot data (Rice and Peet 1997; Rice et al. 2001; Faestal 2012), and may be locally abundant, including *Carya cordiformis*, *Quercus phellos*, *Pinus taeda*, *Fraxinus pennsylvanica*, *Ulmus americana*, *Carya ovata*, *Quercus shumardii*, *Quercus lyrata*, *Platanus occidentalis*, *Betula nigra*, or *Celtis laevigata* often are present as small individuals and may grow to the canopy in disturbed areas. On the highest ridges, transitional to Mesic Mixed Hardwood Forest, a few *Fagus grandifolia* or *Quercus alba* may be present. The understory is usually dominated by *Carpinus caroliniana*. *Ilex opaca*, *Asimina triloba*, *Acer rubrum*, *Ulmus alata*, *Acer negundo*, *Crataegus marshallii*, *Crataegus microperma*, *Diospyros virginiana*, and *Nyssa sylvatica* are frequent along at least some rivers and most may dominate some areas. Shrubs are generally moderate to low in density. The only species with very high constancy is *Ilex decida*. *Arundinaria tecta* often dominates patches. *Lindera benzoin*, *Euonymus atropurpureus*, *Euonymus americanus*, and *Viburnum prunifolium* are at least fairly frequent in plots from some rivers. *Vaccinium elliotii*, *Vaccinium fuscatum*, *Itea virginica*, *Eubotrys racemosa*, and *Symplocos tinctoria* are less frequent in plots but often noted in site descriptions. Woody vines are notably diverse and many can be locally abundant. Species with high-to-moderate frequency in plots include *Toxicodendron radicans*, *Bignonia capreolata*, *Parthenocissus quinquefolius*, *Muscadinia rotundifolia*, *Smilax rotundifolia*, *Smilax bona-nox*, *Smilax glauca*, *Smilax hispida*, *Smilax smallii*, *Campsis radicans*, *Nekemias arborea*, *Thyrsanthella difforme*, *Berchemia scandens*, *Hydrangea (Decumaria) barbara*, several species of *Vitis*, and the exotic *Lonicera japonica*. Herbs are generally sparse to moderate in density. None have the frequency in plot data that many of the woody species do. Frequent species at least along some rivers include *Dichanthelium commutatum*, *Boehmeria cylindrica*, *Leersia virginica*, *Mitchella repens*, *Festuca subverticillata*, *Cinna arundinacea*, *Leersia oryzoides*, *Hypericum walteri*, *Saururus cernuus*, and many species of *Carex* (*abscondita*, *typhina*, *crinita*, *corrugta*, *louisianica*, *crebriflora*, *radiata*, *grayi*, and *amphibolia* are at least fairly frequent). A great variety of other herbs of rich, mesic, or wet forests may be present, such as *Arisaema triphyllum*, *Chasmanthium latifolium*, *Chasmanthium laxum*, *Osmorhiza longistylis*, *Polystichum acrostichoides*, *Geum canadense*, *Persicaria virginiana*, *Glyceria striata*, *Sanicula canadensis*, *Elymus virginicus*, and *Mikania scandens*. *Tillandsia usneoides* may be abundant on trees. **Range and Abundance:** Ranked G3G4. In North Carolina the High Subtype occurs along the inner and middle Coastal Plain portions of all brownwater rivers but becomes scarce in the outer Coastal

Plain. This subtype, being drier, has more often been converted to agriculture or pine plantation. It also is the most easily logged. Its original extent has been greatly reduced, and it is one of the rarest floodplain communities. The synonymized NVC association ranges from Virginia to Georgia.

Associations and Patterns: The High Subtype usually occurs in a mosaic with Cypress–Gum Swamp and sometimes with the Low or Swamp Transition Subtype. It may border Brownwater Levee Forest and may border Mesic Mixed Hardwood Forest but more often is separated by wetter communities.

Variation: No variants are recognized at present but the possibility warrants further investigation. A separate High Pine-Oak Subtype was recognized in earlier drafts of the Fourth Approximation and was also provisionally included in the NVC as *Pinus taeda* - *Quercus* (*pagoda*, *michauxii*, *shumardii*) Temporarily Flooded Forest (CEGL007550). Both were later lumped. *Pinus taeda* patches are generally regarded as successional after natural or human disturbance rather than an enduring distinct community. Consistent differences in sites or associated vegetation have not been identified. However, given the numerous naturally disturbed patches in recent years that have not regenerated in pine, the possibility remains.

Rice et al. (2001) on the Roanoke River recognized a rarely flooded community and a temporarily flooded community, the latter most typical of the High Subtype and the former transitional to Mesic Mixed Hardwood Forest. They also recognize phases within each. It is unclear if these variations are repeated beyond the Roanoke River. Alternatively, differences in the High Subtype among rivers could be great enough to recognize as variants.

The NVC description of *Quercus michauxii* - *Quercus shumardii* - *Liquidambar styraciflua* / *Arundinaria gigantea* Forest (CEGL002099), a floodplain community of states farther west, emphasizes *Quercus shumardii* as an indicator. Given the irregular occurrence of this species in North Carolina's examples, its ecological significance here may be worth investigating.

Dynamics: The dynamics of Brownwater Bottomland Hardwoods are similar to most Coastal Plain Floodplain communities and to many other forests. Flooding does not represent a significant disturbance, but the nutrient enrichment brought by even the infrequent flooding presumably is important.

The presence of occasional patches dominated by *Pinus taeda* in this community suggests questions about its dynamics. Most forests dominated by this species represent successional stands following past agricultural clearing. However, some are in remote locations where it is unclear if farming would have been attractive. A study of pine stands on the Congaree River in South Carolina (Pederson et al. 1997) found that even recent severe hurricane disturbance was not sufficient to allow regeneration of current pine dominance. They concluded that these stands result from undocumented agricultural fields and suggest that *Pinus taeda* probably occurred as scattered individuals or groves before settlement.

Comments: Study of vegetation at Congaree National Park in South Carolina (Landaal et al. 1998) resulted in creation of NVC associations that appear similar or equivalent to the High Subtype as

defined here. *Liquidambar styraciflua* - *Quercus* (*laurifolia*, *nigra*) - (*Pinus taeda*) / *Arundinaria gigantea* / *Carex abscondita* Forest (CEGL007732) has been attributed to North Carolina. It seems to overlap with the concept of the High Subtype. A segregation of *Quercus laurifolia* from *Quercus michauxii* and *Quercus pagoda*, implied by the name, does not appear to occur in North Carolina within higher bottomland hardwoods, though *Quercus laurifolia* occurs without the others in wetter subtypes.

Rare species: Vascular plants: *Cardamine douglassii*.
Vertebrate animals: *Dendroica cerulea*.

References:

- Faestal, M. 2012. Classification and description of alluvial plant communities of the North Carolina Coastal Plain. M.S. thesis, University of North Carolina, Chapel Hill.
- Landaal, S., A. Weakley, and J. Drake. 1998. Classification of the vegetation of Congaree National Park. Report to BRD-NPS Vegetation Mapping Program, National Park Service, The Nature Conservancy, Chapel Hill, NC. 67 pp.
- Pederson, N.A., R.H. Jones, and R.R. Sharitz. 1997. Age structure and possible origin of old *Pinus taeda* stands in a floodplain forest. *Journal of the Torrey Botanical Club* 124: 111-123.
- Rice, S.K., R.K. Peet, and P. Townsend. 2001. Gradient analysis and classification of the forests of the lower Roanoke River floodplain, North Carolina: a landscape perspective. Unpublished manuscript.
- Rice, S.K., and R.K. Peet. 1997. Vegetation of the Lower Roanoke River Floodplain. Unpublished report to The Nature Conservancy.